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If the eccentricity of the orbit is not large enough to allow $\delta\mu_0$ to be made directly one of the unknown quantities, and it is preferred to treat ω' a', k', $\tan \nu'$ directly as the elements, and to determine the coordinates by

$$\begin{aligned}15 \cos\delta\,.\,(\alpha - \mathrm{A}) = x &= a'k'\,.\,\rho \sin(v+\omega')\\ \delta - \mathrm{D} = y &= a'\,.\,\rho\cos(v+\omega') + a'\,.\,\rho\sin(v+\omega')\,.\,\tan\nu'\\ &= a' \sec\nu'\,.\,\rho\cos(v+\omega'-\nu'),\end{aligned}$$

the equations of condition between the differences of the observed and computed coordinates and the corresponding variations of the elements become

$$\begin{aligned}\delta x = &+[\cos(v+\omega') + e\cos\omega']\,.\,k'\,.\,\frac{a'\sec\phi}{57{\cdot}3}[\delta(\mu_0+\omega') + (t-t_0)\,\delta n]\\ &-[\cos(v+\omega')(\cos\epsilon\,.\,\cos\phi + \tan\tfrac{1}{2}\phi) + \cos\omega']\,.\,k'\,.\,a'(\tan\phi + \delta e)\sin\delta\omega'\\ &+[\cos(v+\omega')\sin\epsilon - \sin\omega'\cos\phi]\,.\,k'\,.\,a'[(\tan\phi+\delta\epsilon)\cos\delta\omega' - \tan\phi]\\ &+\frac{x}{a'k'}\,.\,\delta(a'k') + 15\cos\delta\,.\,\delta\mathrm{A}\,\ldots\end{aligned}$$

$$\begin{aligned}\delta y = &-[\sin(v+\omega'-\nu') + e\sin(\omega'-\nu')]\sec\nu'\,.\,\frac{a'\sec\phi}{57{\cdot}3}[\delta(\mu_0+\omega') + (t-t_0)\,\delta n]\\ &+[\sin(v+\omega'-\nu')(\cos\epsilon\,.\,\cos\phi + \tan\tfrac{1}{2}\phi) + \sin(\omega'-\nu')]\,.\,\sec\nu'\\ &\qquad\qquad .\,a'(\tan\phi+\delta e)\sin\delta\omega'\\ &-[\sin(v+\omega'-\nu')\sin\epsilon + \cos(\omega'-\nu')\cos\phi]\,.\,\sec\nu'\\ &\qquad\qquad .\,a'[(\tan\phi+\delta e)\cos\delta\omega' - \tan\phi]\\ &+\rho\sin(v+\omega')\,.\,a'\,\delta(\tan\nu')\\ &+\frac{y}{a'}\,.\,\delta a' + \delta\mathrm{D}\,\ldots\end{aligned}$$

from which the most probable values of the corrections are to be deduced. The elements ω, i, are then found by the formulæ previously given.

Observations of Nova Cygni, of some of the Planets, and of Comet Barnard, made at Mr. Wigglesworth's Observatory with the 15·5-inch Cooke Equatorial. By J. G. Lohse.

Nova Cygni.

1885, Sept. 1.—*Nova Cygni* is of the same brightness as the small star of the 15th magnitude north preceding of it. No change in the brightness of the other stars, which were all seen, could be made out.

Oct. 3.—*Nova Cygni* was examined with a magnifying power of 260. It has become a little brighter, and is only 0·3 mag.

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fainter than the stars Nos. 68 * and 73. The star No. 68 is a little brighter than No. 73, but the difference is scarcely 0·1 mag. *Nova Cygni* is not so well defined as the comparison stars, and is certainly surrounded by nebulosity. Attempts were made to see *Nova Cygni* with a McClean prism held in front of the eyepiece, but no trace of light could be recognised. The spectrum of the other three stars, forming with *Nova* a trapezium, could be seen without much difficulty, especially that of the 11th magnitude star No. 60.

Oct. 7.—*Nova Cygni* is of a bluish colour and surrounded by nebulosity. It is more than double as bright as the star No 50, and about of the same brightness with Nos. 68 and 73 No. 68 is a little brighter than No. 73.

Oct. 26.—*Nova Cygni* was examined with magnifying powers of 330 and 130. It is decidedly surrounded by nebulosity, and about 0·3 mag. fainter than the stars Nos. 68 and 73. No. 73 is nearly 0·1 mag. brighter than No. 68. No. 50 was very well seen, but it has not half the light of *Nova Cygni.*

Dec. 1.—*Nova Cygni* is 0·3 magnitude smaller than stars Nos. 68 and 73. Definition poor.

1886, May 1.—*Nova Cygni* is of the 14·5 magnitude. No change amongst the neighbouring stars was noticed.

July 5.—*Nova Cygni* is of the 14th magnitude, and nebulous in appearance.

July 22.—*Nova Cygni* is equal in brightness to star No. 73, and 0·2 mag. fainter than No. 68. *Nova* appears nebulous. The 15th mag. companion of *Nova* was also seen.

Aug. 2.—*Nova Cygni* is equal in brightness to stars Nos. 68 and 73. The 15th mag. star near it was very well seen.

The estimations indicate a small increase in the brightness of *Nova* during October, and it seems that one of the comparison stars is variable to a very small extent.

Venus.

On January 2 and February 3, 1886, the dark part of *Venus* was distinctly seen by Mr. Wigglesworth and Mr. Lohse; it is of a gray colour, except near the terminator, where the secondary spectrum causes it to appear blue, and compared with the bright part of *Venus* it looks very much smaller. On January 2, from $5^h\ 15^m$ to $5^h\ 35^m$ G.M.T., when the definition was very good, the upper or south horn appeared rounded while the lower one was quite sharp. In prolongation of the lower horn, but perfectly separated from it, was a bright narrow line of light about $\frac{1}{20}$ of the diameter of *Venus* in length. A similar phenomenon is often presented by the mountains of the Moon near the south horn, which appear along the edge as a detached irregular line of light as long as the summits only are illuminated.

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* *Copernicus*, vol. ii. p. 118.

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Mars.

During the opposition of 1886 the white spots near the poles of *Mars* were very small. On April 23, 10^{h} 38^{m} G.M.T., both white spots were very well seen; the northern spot was brighter than the southern one, but in size they were about equal. The diameter of the spots was estimated to be $\frac{3}{4}''$. On April 26, 9^{h} G.M.T., the northern white spot was very well seen; it seemed larger than on April 23, but the southern white spot was certainly not visible at the time.

Saturn.

1885, Nov. 17.—The globe extends at the top beyond Cassini's division, and encroaches on the outer ring to the extent of a quarter to one-third of the breadth of the latter. Encke's division was seen in the ansæ four-tenths of the breadth of the outer ring from Cassini's division.

Nov. 18.—Encke's division was seen in the same position, and the globe's shadow on the crape ring was noticed distinctly. Definition good.

Dec. 2, 13^{h} 45^{m} G.M.T.—*Mimas* was seen distinctly in elongation on the following side. *Saturn* was not artificially obscured at the time nor moved out of the field. Encke's division was plainly seen in both ansæ nearly in the middle of the ring.

Dec. 26.—There is a northern and a southern belt and a dark polar cap on *Saturn*. The brown copper colour of the globe was very strongly shown. Encke's division was seen, and dark parallel lines on the inner side of the ansæ of the inner bright ring.

1886, Jan. 2.—The polar cap is darker than the south belt.

Feb. 3.—Encke's division was very well seen by Mr. Wigglesworth and Mr. Lohse.

March 25.—*Saturn* was very well seen. Encke's division could be traced very nearly right round, when the definition was at its best. The division is two-fifths from the outer edge and three-fifths from Cassini's division. At 8^{h} 2^{m} G.M.T., Mr. Wigglesworth saw *Mimas* in southern conjunction. Mr. Lohse tried to see it as well, but could not do so with certainty. The southern and northern dark belts showed very well, and the globe was plainly visible through the crape ring. Mr. Wigglesworth observed a faint narrow dark marking in the middle of the bright equatorial zone.

The dimensions of *Saturn* were measured 1885, Dec. 26, and 1886, Jan. 2, and the following are the mean results reduced to mean distance ($\log = 0{\cdot}97950$):

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Exterior diameter of outer ring (A)	40″·95
Interior „ „ „	35·53
Exterior diameter of inner ring (B)	34·38
Interior „ „ „	25·55
„ „ of crape ring (C)	20·97
Equatorial „ of globe	18·57

On Jan. 2 the following quantities were also measured, and reduced to mean distance give

Polar diameter of outer ring (A)	19″·06
Distance of south pole from south limb	1·81
„ „ belt „ north „	8·14

Considering the equator coincident with the plane of the rings, the south belt would be situated in 25°·8 south kronocentric latitude.

Neptune.

The following observations of the satellite of *Neptune* were made. The satellite was always very faint; it was estimated to be of the 14th magnitude.

Date.	Greenwich M. T.	Position.	Distance.
	h m	°	″
1885, Dec. 2	12 48	41·71	17·62
1886, Nov. 2	14 19·5	40·78	16·71
4	14 49	247·88	14·14